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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,988	07/28/2003	Chih-Ming Lin	22877-6230	7161

7590 01/14/2005  
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EXAMINER
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LAVARIAS, ARNEL C

ART UNIT	PAPER NUMBER
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2872

DATE MAILED: 01/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/628,988

Applicant(s)

LIN ET AL.

Examiner

Arnel C. Lavarias

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Drawings***

1. The drawings were received on 7/28/03. These drawings are acceptable.

### ***Response to Amendment***

2. The amendments to the abstract and specification of the disclosure in the submission filed 11/2/04 are acknowledged and accepted. In view of these amendments, the objections to the abstract and specification in Sections 5-6 of the Office Action dated 7/30/04 are respectfully withdrawn.
3. The amendments to Claims 1, 3-6, 8, 11-13 in the submission filed 11/2/04 are acknowledged and accepted. In view of these amendments, the objections to the claims in Section 7 of the Office Action dated 7/30/04 are respectfully withdrawn.
4. The addition of Claim 16 in the submission filed 11/2/04 is acknowledged and accepted.

### ***Response to Arguments***

5. The Applicants' arguments, see in particular Pages 13-15 Applicants' remarks, filed 11/2/04, with respect to the rejection(s) of Claim(s) 1 under 35 U.S.C. 102(b) as being anticipated by Tanaka have been fully considered and are persuasive, insofar as Tanaka does not specifically disclose the beamsplitter as being a mirror (See 13 in Figure 1 of Tanaka), even though the beamsplitter of Tanaka includes the reflective properties of a

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mirror. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the teachings of Tanaka and Kiemle (U.S. Patent No. 3770886).

6. Claims 1-16 are now rejected as follows.

***Claim Objections***

7. Claims 1-15 are objected to because of the following informalities:

Claim 1, line 9- 'steeling' should read 'steering'. Claims 2-15 are dependent on Claim 1, and hence inherit the deficiencies of Claim 1.

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1, 5, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (U.S. Patent Application Publication US 2002/0057486A1), of record, in view of Kiemle (U.S. Patent No. 3770886).

Tanaka discloses a compact holographic data storage system (See for example Figures 1, 7, 9, 10) comprising a volume holographic recording medium (See 10 in Figure 1) for storing superimposed interference patterns; a laser beam emitting assembly (See 11 in

Figure 1) having a large output area for emission of parallel laser beams with proper wavelength and cross sectional shape; a beam splitter (See 13 in Figure 1) being disposed in the optical path of parallel beams for separating out a first portion (See 12b in Figure 1) of the parallel beams; a beam steering system (See 18 in Figure 1) for steering the partially separated beam as reference beam, such that the reference beam can be directed into the volume holographic recording medium with a proper incident position and angle and cross-sectional phase distribution; and a spatial light modulator (See 15 in Figure 1) comprising light gating components disposed in the optical path of a second portion (See 12a in Figure 1) of the parallel beams for holographic data input; a photodetector (See 20 in Figure 1) as two dimensional grating format for detecting regenerated signal after the reference beam is directed to the volume holographic recording medium, during data read from the holographic medium. Tanaka additionally discloses the mirror disposed in the optical path of parallel beams separating out a portion of the parallel beams in slices as reference beam to be directed to the beam steering system (See 13 in Figure 1, which acts as a partially reflecting beamsplitter); the spatial light modulator is implemented with a two dimensional transmissive LCD panel for controlling on/off of the light gating components as parallel beams pass through the two dimensional transmissive LCD panel serving as input apparatus to the holographic recording medium (See 15 in Figure 1); and the photodetector is implemented with a CCD camera for detecting the reconstructed beam as the reference beam enters the volume holographic recording medium and acts as a data readout apparatus for the holographic medium (See 20 in Figure 1). Tanaka lacks the partially reflective beamsplitter specifically being a mirror. However, the use of

partially reflective mirrors in such holographic recording and reconstruction systems are well known in the art. For example, Kiemle teaches a conventional holographic recording system, wherein a partially permeable mirror is utilized (as an equivalently functioning optical element to a partially reflecting beamsplitter) to split the incident source beam into a reference and object beam (See 4 in Figure 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the partially reflective beamsplitter in the holographic recording system of Tanaka be replaced by the equivalently functioning partially permeable mirror, as taught by Kiemle, to reduce the cost, size, and weight of the holographic optical system.

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kiemle as applied to Claim 1 above, and further in view of Ashizaki (U.S. Patent Application Publication US 2003/0007129A1), of record.

Tanaka in view of Kiemle discloses the invention as set forth above in Claim 1, except for the laser beam emitting assembly generating laser beams to pass through a cylindrical collimated lens and a rectangular aperture to become parallel beams with proper cross sectional shape. However, Ashizaki teaches a holographic recording device (See for example Figures 2A-B), wherein light emitted from the laser source (See 21 in Figure 2A) passes through a cylindrical collimated lens (See 28 in Figures 2A-B) and rectangular aperture (See 29 in Figures 2A-B) prior to reaching the recording medium (See 3 in Figures 2A-B). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the laser beam emitting assembly generating laser beams to pass through a cylindrical collimated lens and a

rectangular aperture to become parallel beams with proper cross sectional shape, as taught by Ashizaki, in the holographic optical system of Tanaka in view of Kiemle, for the purpose of preventing unwanted stray light from reaching the holographic recording medium.

11. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kiemle, and further in view of Ashizaki as applied to Claims 1-2 above, and further in view of Rakuljic et al. (U.S. Patent No. 5684611), of record.

Tanaka in view of Kiemle, and further in view of Ashizaki discloses the invention as set forth above in Claims 1-2, except for the laser comprising either a group of laser diodes with different wavelengths and with a servo mechanism for fixing laser diode with selected wavelength, or a single tunable wavelength laser. However, Rakuljic et al. teaches a holographic data recording system (See for example Figures 10-12), wherein the light source for the system includes either a group of laser diodes with different wavelengths and with a servo mechanism for fixing laser diode with selected wavelength (See 61, 62, 63 in Figure 12), or a single tunable wavelength laser (See 22, 23, 38 in Figure 10). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the laser source of Tanaka in view of Kiemle, and further in view of Ashizaki comprise either a group of laser diodes with different wavelengths and with a servo mechanism for fixing laser diode with selected wavelength, or a single tunable wavelength laser, as taught by Rakuljic et al., for the purpose of enhancing storage capacity via wavelength multiplexing of the recorded holograms.

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12. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kimle as applied to Claim 1 above, and further in view of Leith et al. (U.S. Patent No. 3580655).

Tanaka in view of Kimle discloses the invention as set forth above in Claim 1, except for the mirror comprising a narrow rectangular aperture for separating out a portion of the parallel beams in slices as reference beam to be directed to the beam steering system. However, Leith et al. teaches various conventional holographic recording systems (See for example Figures 8, 13), wherein a fully reflecting mirror is used to separate out a cross-sectional portion of the input laser light beam and generate a reference beam. The aperture of the mirror presents a rectangular aperture, generating a reference beam of rectangular cross-section. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the mirror comprise a narrow rectangular aperture for separating out a portion of the parallel beams in slices as reference beam to be directed to the beam steering system, as taught by Leith et al., in the system of Tanaka in view of Kimle, to simplify and reduce the size and cost of the holographic optical system.

13. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kimle.

Tanaka in view of Kimle discloses the invention as set forth above in Claim 1. Tanaka in view of Kimle additionally discloses numerous reflective mirrors (See for example 17, 18 in Figure 1; Paragraph 0007 of Tanaka). Tanaka in view of Kimle lacks a servo mechanism used to control the reflective angle of the mirror and mirror position to



direct the reference beam into the volume holographic recording medium. However, the use of a mechanism, such as a servo and associated controller, to control the angle and position of mirror 18 in Figure 1 of Tanaka is implied and is obvious to one having ordinary skill in the art. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include a servo mechanism to control the reflective angle of the mirror and mirror position to direct the reference beam into the volume holographic recording medium in the system of Tanaka in view of Kimle, to simplify, or even automate, the implementation of angle and spatial multiplexing in the holographic recording system, thus increasing read/write speed and storage capacity.

14. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kimle as applied to Claim 1 above, and further in view of Wuerker (U.S. Patent No. 3615123), of record.

Tanaka in view of Kimle discloses the invention as set forth in Claim 1, except for the beam steering system being an opto-electronic device using the built-in opto-electronic mechanism to control the incident position and angle of the reference beam into the volume holographic recording medium. However, Wuerker teaches a multiple exposure holographic recording system (See for example Figures 1, 2, 4), wherein deflection of the reference beam (See for example 16 in Figures 1, 2, 4) is accomplished by use of an electro-optic steering device in the form of an electro-optic retarder and birefringent crystal (See for example 30, 31, 32 in Figure 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the beam steering system be an opto-electronic device using the built-in opto-electronic

mechanism to control the incident position and angle of the reference beam into the volume holographic recording medium, as taught by Wuerker, in the system of Tanaka in view of Kimle, to take advantage of increased rate/frequency of operation of the electro-optic devices, thus allowing for increased rates of recording.

15. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kimle as applied to Claim 1 above, and further in view of Horimai (U.S. Patent Application Publication US 2002/0114027A1), of record.

Tanaka in view of Kimle discloses the invention as set forth above in Claim 1, except for the beam steering system including a phase modulator, such as a transmissive LCD panel, in the optical path of the laser to modulate the reference beam with proper cross-sectional phase distribution. However, Horimai teaches a holographic recording system (See for example Figure 1) for recording data onto a holographic recording disk (See 1 in Figure 1). Additionally, a phase modulator in the form of a transmissive LCD screen is utilized in the beam paths of both the object and reference beams to impart a predetermined phase distribution onto these beams (See 17, 18 in Figure 1; Paragraphs 0126-0127). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the system of Tanaka in view of Kimle include a phase modulator, such as a transmissive LCD panel, in the optical path of the laser to modulate the reference beam with proper cross-sectional phase distribution, as taught by Horimai, for the purpose of further increasing the storage capacity of the recording medium via phase multiplexing.

16. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kimle as applied to Claim 1 above, and further in view of Dewald (U.S. Patent No. 5481523), of record.

Tanaka in view of Kimle discloses the invention as set forth above in Claim 1, except for the SLM being implemented with a two-dimensional reflective LCD panel for controlling reflection or no reflection on the light gating components as the parallel beams reflect off the two-dimensional reflective LCD panel serving as an input apparatus to the holographic recording medium. However, Dewald teaches a holographic recording system (See for example Figures 2-3), wherein use of a reflective SLM in the form of an LCD panel is used to encode the object beam (See 64 in Figures 2-3; col. 4, line 45-col. 5, line 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the SLM be implemented with a two-dimensional reflective LCD panel for controlling reflection or no reflection on the light gating components as the parallel beams reflect off the two-dimensional reflective LCD panel serving as an input apparatus to the holographic recording medium, as taught by Dewald, in the holographic optical system of Tanaka in view of Kimle, for the purpose of reducing the size of the holographic system.

17. Claims 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Kimle.

Tanaka in view of Kimle discloses the invention as set forth above in Claim 1. Additionally, Tanaka in view of Kimle discloses the holographic recording medium being of a photorefractive material, such as lithium niobate doped with terbium (See Paragraphs

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0004, 0067). Tanaka in view of Kimle lacks the recording material being a photorefractive material such as iron doped lithium niobate or barium titanate, or an organic photosensitive material. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the recording material be a photorefractive material such as iron doped lithium niobate or barium titanate, or an organic photosensitive material, since it has been held to be within the ordinary skill of worker in the art to select a known material on the basis of its suitability for the intended use. One would have been motivated to have the recording material be a photorefractive material such as iron doped lithium niobate or barium titanate, or an organic photosensitive material, to take advantage of such materials having very high diffraction efficiency and photosensitivity, while maintaining nondestructive readout of the recorded holograms. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 54 USPQ 297 (1945).

18. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka in view of Leith et al.

Tanaka discloses a compact holographic data storage system (See for example Figures 1, 7, 9, 10) comprising a volume holographic recording medium (See 10 in Figure 1) for storing superimposed interference patterns; a laser beam emitting assembly (See 11 in Figure 1) having a large output area for emission of parallel laser beams with proper wavelength and cross sectional shape; a beam splitter (See 13 in Figure 1) that intercepts a portion of the parallel beams and redirects the intercepted portion (See 12b in Figure 1); a beam steering system (See 18 in Figure 1) for steering the intercepted portion of the

parallel beams as reference beam, such that the reference beam can be directed into the volume holographic recording medium with a proper incident position and angle and cross-sectional phase distribution; and a spatial light modulator (See 15 in Figure 1) comprising light gating components disposed in the optical path to receive a remaining portion (See 12a in Figure 1) of the parallel beams for holographic data input; photodetectors (See 20 in Figure 1) as two dimensional grating format for detecting regenerated signal after the reference beam is directed to the volume holographic recording medium reconstructing a stored holographic data input. Tanaka lacks the limitation that none of the remaining portion of the parallel beams was incident upon the beam splitter. However, Leith et al. teaches various conventional holographic recording systems (See for example Figures 8, 13), the systems utilizing various alternative optical elements functioning as a beam splitter to separate out a reference beam and object beam from the incident source light. In particular, Leith et al. teaches embodiments where the beam splitter may be a fully reflecting mirror (See for example 26 in Figures 8 and 13), wherein the object beam (i.e. the remaining portion leftover from the incident source light after the source light traverses the beam splitter; See 29 in Figures 8, 13; col. 7, lines 27-62) is not incident on the beam splitter. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have none of the remaining portion of the parallel beams be incident upon the beam splitter, as taught by Leith et al., in the holographic recording system of Tanaka, to simplify the holographic optical system, since fewer optical elements are required.

*Conclusion*

19. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 8:30 AM - 5 PM EST.

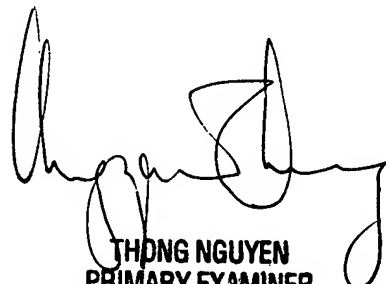
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Arnel C. Lavarias  
1/10/05



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